Progressive Education Society's
Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16
(Autonomous)
End Semester Examination: March/April 2024
Faculty: Science and Technology
Semester: IV

Program: BScGen03 **SET: B**
Program (Specific): General B.Sc. **Course Type: CC**
Class: S. Y. B.Sc. (General) **Max. Marks: 35**
Name of the Course: Test of Significance and Statistical Methods
Course Code: 23-ST-241 **Time: 2Hr**
Paper: I

Instructions to the candidate:

1) ***There are 5 questions in the question paper. Write each question on separate page.***
2) ***All questions are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw a well labelled diagram wherever necessary***
5) ***Use of statistical tables and scientific calculator are allowed.***

Q1) Choose the correct alternative in each of the following: **[1x5=5]**

1) Type I error is _____.

a) accepting H_0 when it is false b) rejecting H_0 when it is false
c) accepting H_1 when it is false d) rejecting H_0 when it is true

2) The range in which partial correlation coefficient lies, is _____.

a) -1 to 1 b) 0 to 1
c) 0 to ∞ d) -∞ to ∞

3) The traffic intensity or the utilization factor (ρ) in case of M/M/1 model is ____.

a) $\frac{\lambda}{\mu}$ b) $\frac{1}{\mu-\lambda}$
c) $\frac{\mu}{\lambda}$ d) $\frac{\lambda}{\mu(\mu-\lambda)}$

4) The relative frequency of deaths in a population is referred as____

a) Fertility b) Mortality
c) Crude Birth Rate d) General Fertility Rate

5) The level of significance (α) is the probability of _____.

a) accepting H_0 when it is false b) rejecting H_0 when it is false
c) accepting H_1 when it is false d) rejecting H_0 when it is true

Q2) a) State whether the following is true or false (Any two) **[1 x 2=2]**

1) Standard Error of a statistic is the variance of its sampling distribution.
2) The M/M/1 queuing model deals with a queuing system having a single service channel with Poisson arrival, exponential distribution for services.
3) Infant mortality rate is the number of deaths of children under 1 years of age per 1000 lives of birth.

b) Define/State the following: (Any two) **[1 x 2=2]**

1) Infant mortality rate.Test statistic
2) Partial correlation coefficient
3) traffic density in a queuing model

Q3) Attempt any two from the following: **[2 x 4=8]**

1) Describe the test procedure for testing the equality of two population proportions of units possessing a certain characteristic .

2) Define crude death rate and standardized death rate. Explain direct method of standardization.

3) Let X_1, X_2 and X_3 be the marks of students in final examination ,1st term and 2nd term examinations. Data on X_1, X_2 and X_3 showed the following results:

   $\overline{X_1}$= 68, $\overline{X_2}$= 70 , $\overline{X_3}$= 74 ; σ_1 = 10, σ_2 = 5, σ_3 = 9

   r_{12} =0.6, r_{13}= 0.7, r_{23}= 0.65

   Obtain the equation of X_1 on X_2 and X_3.

Q4) Attempt any two from the following **[2x4=8]**

1) A sample of 100 items drawn from a population has a mean value 63.5. It is known that population s.d is 3. Can we regard this sample to be coming from population with mean 64? Use 5% l.o.s.

2) Compute i) R2.13 ii) r13.2 for the data given below:
   r_{12} =0.63, r_{13}= 0.40, r_{23}= 0.32

3) Calculate Total Fertility rate (T.F.R.) and Gross Reproduction Rate (G.R.R) by considering proportion of female births as 0.48, for the following data:

Age group	15-19	20-24	25-29	30-34	35-39	40-44
Population (in thousands)	16	26	21	18	11	11
Age-S.F.R.	60	285	322	260	125	10

Q.5) Attempt any two from the following **[2x 5=10]**

1) In a random sample of 800 persons from rural area, 200 were found to be smokers. While out of 1000 persons from urban area, 300 were found to be smokers. Test whether proportion of smokers is the same for both the populations. (Use $\alpha = 0.05$) Also construct 95% confidence interval for the population proportion.

2) Customers arrive at a window in a bank, according to a Poisson distribution with mean 10 per hour. Service time per customer is exponential with mean 5 minutes. The space in front of the window including that for the serviced customers can accommodate a maximum of three customers. Other customers can wait outside this space.
   i) How long is an arriving customer expected to wait before being served?
   ii) What is the probability that an arriving customer can go directly to the space in front of the window?

3) Describe the test procedure for testing the null hypothesis $H_0 : \mu_1=\mu_2$ against the alternative hypothesis : $H_1 : \mu_1 \neq \mu_2$ where μ_1 and μ_2 are the means of two populations from which the two independent samples have been drawn.

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